IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Robert W. KILLICK et al.

Title: Adjuvant Composition for Chemicals Used in Agriculture

Appl. No.: 09/831,301

Filing Date: 05/08/2001

Examiner: A. Pryor

Art Unit: 1616

DECLARATION UNDER 37 C.F.R. § 1.132

I, Peter William Jones, hereby declare and state that:

1. I am the Product Development Manager employed by Innovative Chemical Services Pty Ltd of 14 Dallas Street, Mount Waverley Victoria 3149 Australia, which provides technical services to Victorian Chemicals International Pty. Ltd. of 83 Maffra Street, Coolaroo, Victoria 3048, Australia.

2. I am one of the co-inventors of the invention described in the above-identified patent application entitled "Adjuvant Composition for Chemicals Used in Agriculture" which was given United States Serial No. 09/831,301, and accordingly I am familiar with the content of the present application.

3. The pending claims in the above-captioned U.S. patent application relate to a homogeneous liquid adjuvant composition which comprises a mineral oil or an alkyl ester of a fatty acid, one or more ammonium salts of inorganic anions and one or more cationic emulsifiers selected from the group consisting of fatty amines, fatty amine oxides and mixtures thereof. The purpose of the adjuvant composition is primarily to increase the efficacy of herbicides although it is also useful for increasing the efficacy of other agrochemicals.

4. The present invention provides a comparatively stable homogeneous liquid composition which contains lipophobic components, being inorganic ammonium salts and a lipophilic component, being the mineral oil or alkyl ester of fatty acid with a cationic emulsifier which acts as a coupling agent. The key to the invention is the amounts of the ammonium salts which can be combined with the lipophilic solvent. The cationic emulsifier is the

key to achieving the coupling and must be present in an amount sufficient to achieve this coupling.

5. Inorganic ammonium salts are lipophobic, that is, more soluble in water than in oil. It is expected that such a lipophobic species would only form a homogenous liquid when combined with a lipophobic solvent such as water. However, it is counter intuitive to persons skilled in the art that such a lipophobic species could be formed into a homogenous composition with a lipophilic solvent such as vegetable oil.

6. To the best of my knowledge, there has been no disclosure of a homogenous liquid composition comprising inorganic ammonium salts and a lipophilic solvent using cationic emulsifiers as a coupling agent prior to the filing of the above-captioned application.

7. Further, to the best of my knowledge, whilst there has been a need for sometime for such a combined product in the USA and other farming communities, such a homogeneous combined product has not been developed and sold commercially.

8. The examiner has requested further information regarding why it is important to have a single homogeneous product containing these known components.

   (a) The three components of the invention have all been previously used individually as adjuvants to enhance or protect the performance of herbicide spray applications. The provision of the three components as a single combined product offers a convenient adjuvant which can work in a number of ways and avoids unforeseen problems.

   (b) Farmers generally know little about how adjuvants work and hence may inadvertently use them inappropriately. When applying an agrochemical, such as glyphosate, most farmers would be aware that a number of factors can reduce the performance of the agrochemical and they would also be aware that adjuvants may be used to counter the reduced performance. The adjuvants sold to counter each of the individual problems will only contain instructions regarding the use of that product with the agrochemical and will not contain instructions regarding its use with other adjuvants. Accordingly when a farmer encounters more than one performance decreasing factor (eg hard water, hot dry conditions and difficult to wet plant surfaces), the farmer may want to add a number of adjuvant products to counter all of the problems but the farmer will not have any instructions regarding what adjuvant products can be combined together nor what amounts of the adjuvants products to use in combination. Unfortunately there may be inadvertent interactions between the adjuvant products limiting their effects or even resulting in adverse effects.

Further, the farmer has to select a usage rate for each product which increases the likelihood of unforeseen interactions or wastage of excess chemicals.

(c) Example 1 in the present application provides evidence of this. Composition 6 contains the 3 separate adjuvant products used together as a farmer would need to do as described above. The control of the broadleaf weed Spiny Emex for Composition 6 was less effective than that achieved for either Composition 4 or Composition 5 which are two of the same adjuvant products used singularly. Hence, a farmer combining the three products would have an outcome which was worse than using the individual products alone. In contrast, Example 1 shows that Compositions 7 - 14 according to the invention generally provided better control of the broadleaf weed with Adjuvants B and D providing especially good results at the two concentrations tested (Compositions 9, 10, 13 and 14).

(d) A single homogeneous product combining the different adjuvant components into a single product therefore is useful and meets a need because it prevents adverse interactions between the components, and between each component and the agrochemical, as the product has been tested and the usage rate established.

(e) Annexure A is a photo illustrating the result of the use of excess chemicals on a farm in Australia. A homogeneous liquid combined product according to the present invention can increase the efficacy of the agrochemical and reduce the amount of agrochemical required to be used as well as ensuring more effective use of the adjuvant components.

9. It is also important for the single product to be a homogeneous liquid. It is not appropriate to prepare an agrochemical product containing all of the appropriate ingredients but which either comprises multiple liquid phases or both liquid and solid phases and needs to be shaken before use.

(a) Products which are not homogeneous and contain, eg oil and water, phases (eg salad dressings) are certainly available and can be used without problems. However, such products are not common-place in agriculture and two phase agricultural products would increase the risk of usage problems.

(b) With increased emphasis on health and safety, the handling practices for agricultural chemicals have changed. Agricultural chemicals, particularly adjuvants, are often packaged in 20L. It is no longer acceptable that farm workers shake such a container in the way that someone may shake their salad dressing prior to use. As a result, a multiphase product would require the

farmer to have another means to achieve the mixing to ensure that the ingredients are delivered in appropriate proportions. To the best of my knowledge, there is no such mixing device, or means for safely and easily mixing an agricultural chemical before adding it to the spray equipment, commonly available to the farmer. Further, pack sizes for agricultural chemicals are increasing such that mixing prior to use is becoming increasingly impractical.

(c) There is also a risk that the farmer would not remember to shake the product or that the product would not be shaken properly. This is because agrochemicals do not normally require to be shaken prior to use. The large drums are opaque and the farmer will not be able to see that the product has more than one phase so this will not remind the farmer to mix the product before use. Further, most agricultural chemicals are either pumped directly from their container into the spray tank directly offering no opportunity for mixing and the user may not even detect that they have only transferred the 'top' phase or 'bottom' phase. If the bottom phase is substantially solid then this may also damage the machinery if it is only designed for liquid products.

(d) Finally, if the product is not mixed properly prior to mixing and the farmer only uses part of the contents, then the wrong amounts of each component may be added to the tank mix resulting in the adverse effects discussed above. In addition, the unmixed components may not be evenly dispersed.

(e) As a result, it is important for liquid products intended for the agricultural industry to be homogeneous liquids. I am aware of an attempt to sell a two phase agricultural product in the USA and this product was not commercially successful.

10. In summary, it is important to have the combined product as a homogeneous liquid because it reduces the risk of adverse effects, the product is more dependable, the product can be sold in larger containers and it can reduce the numbers of cans of agrochemicals used by farmers.

11. In order to demonstrate that the ranges specified in the pending claims are important for achieving the homogeneous liquid adjuvant, an experiment was conducted to illustrate the effect of using amounts outside the ranges claimed.

12. The experiment involved preparing two control formulations which fall within the ranges in the pending claims. Formulation Control A uses mineral oil and formulation Control B uses an alkyl ester of a fatty acid. Further formulations were then prepared which tested values outside of the ranges claimed as follows. The other components in the

formulations were added in ratios consistent with those in the control. For example, when the level of oil was increased the amount of ammonium salt and cationic emulsifier was decreased but the ratio of ammonium salt to cationic emulsifier remained constant with that in the control. The formulations were prepared by combining all of the components and mixing thoroughly until all solids had dissolved (except for formulations 6 and 7) and the components were well mixed. Each formulation was then held at 2°C, 20°C and 54°C for 24 hours and then observed.

Formulation	**Modified component**
1	Cationic emulsifier replaced by nonionic emulsifier in same proportion.
2	Cationic emulsifier replaced by anionic emulsifier in the same proportion. Note that an anionic emulsifier is not appropriate for use with glyphosate because of antagonistic reactions.
3	Cationic emulsifier is not used at all.
4	80% of the mineral oil or alkyl ester of fatty acid is used.
5	60% of the mineral oil or alkyl ester of fatty acid is used.
6	60% of ammonium salt is used.
7	40% of ammonium salt is used.
8	60% of cationic emulsifier is used.
9	20% of cationic emulsifier is used.

13. Annexure B reports the results obtained using a mineral oil as per pending claims 34 to 38. Annexure C reports the results obtained using an alkyl ester of a fatty acid as per pending claims 41 to 45.

14. The results show that if the cationic emulsifier is not present then the product will form two liquid layers, even if the same amount of nonionic or anionic emulsifier is added.

15. The results show that if the amount of the lipophilic solvent (mineral oil or ethyl oleate) used is in excess of the range specified in the claim then the resultant product is not a homogeneous liquid and forms two liquid layers.

16. The results show that if the amount of ammonium salt used is in excess of the range specified in the claim then the resultant product is not a homogeneous liquid and there is a liquid layer and a solid layer.

17. The results show that if a significantly excess amount of the cationic emulsifier are used then a nonhomogeneous intractable mass may result (see formulation 8). However, if a moderate excess amount is used then a homogeneous liquid may be formed with ethyl oleate but not with mineral oil. This is not a surprising result because as discussed above, the cationic emulsifier is the coupling agent and so an amount will be required sufficient to achieve a homogeneous liquid but to a certain extent the addition of an excess amount will not alter the homogeneity of the formulation. How much excess can be added will depend on the other components in the formulation.

18. Formulations C (mineral oil) and D (ethyl oleate) were also prepared to demonstrate that the lower limit is important to the range specified for the cationic emulsifiers. Since small amounts of cationic emulsifier were to be used, the amounts of lipophilic solvent and ammonium salt were chosen at the lowest levels in their ranges. Annexure D reports the results obtained for these formulations. Formulations Control C and Control D which contain 1.5% cationic emulsifier are homogeneous liquids. Whereas Formulations 1C and 1D which contain only 0.5% cationic emulsifier are unstable and will form two layers.

19. A homogeneous liquid adjuvant which falls within the claims of the pending application has been sold commercially in Australia and has been received well by the farmers.

20. I hereby declare that all statements made herein of my own knowledge are believed to be true, and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

13-10-2005

Date

Peter William Jones

Witness Signature

Witness Name & title

TERRY WHITE PHARMACY
VICTORIA GARDENS
Doris Do (Prop)
Cnr Burnley & Victoria Sts, Richmond Vic 3121
Telephone: 9421 5888 Approval No. 21899N

Annexure A

VICTORIAN CHEMICALS

VICTORIAN CHEMICAL CO. PTY. LTD.
ABN 36 004 188 863
83 Maffra St, Coolaroo, Victoria, 3047, Australia
Tel: +61(0) 3-9301 7000 *Fax: +61-(0) 3-9309 7966*
Website: www.vicchem.com *E-mail: products@vicchem.com*

ANNEXURE B: FORMULATIONS FOR PATENT DECLARATION

A

Percentages by weight of components and status of formulae

COMPONENTS	CONTROL A	1A	2A	3A	4A	5A	6A	7A	8A	9A
PROPAR 12 MINERAL OIL	20.0	20.0	20.0	20.0	80.0	60.0	9.41	14.12	8.42	16.84
AMMONIUM SULFATE dry	15.0	15.0	15.0	15.0	3.75	7.5	60.0	40.0	6.32	12.63
Dimethyl laurylamine oxide dry basis; variant surfactant	5.0	-	-	-	1.25	2.5	2.35	3.53	60.0	20.0
Sorbitan mono oleate, 20 moles EO; Tween 80; variant surfactant, dry	-	5.0	-	-	-	-	-	-	-	-
Sodium lauryl ether(2) sulfate; variant surfactant, dry basis	-	-	5.0	-	-	-	-	-	-	-
Water, including water associated with variant surfactant	40.0	40.0	40.0	45.0	10.0	20	18.82	28.24	16.84	33.68
1,3 Butanediol	4.0	4.0	4.0	4.0	1.0	2.0	1.88	2.82	1.68	3.37
$C_{8/10}$ Alkyl glucoside 70%	8.0	8.0	8.0	8.0	2.0	4.0	3.76	5.65	3.37	6.74
Sorbitan monooleate	5.0	5.0	5.0	5.0	1.25	2.5	2.35	3.53	2.11	4.21
Oleic acid diethanolamide	3.0	3.0	3.0	3.0	0.75	1.5	1.41	2.12	1.26	2.53
STATUS	GOOD	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL

CONTROL A – Clear & bright liquid micro-emulsion, stable at 2°C, 20°C and 54°C.
1A – Two separate liquid layers 2A – Two separate liquid layers 3A – Hazy micro-emulsion, unstable at 2°C & 54°C forms two layers. 4A – Two separate liquid layers 5A – Two separate liquid layers 6A – A liquid layer and a solid layer
7A - Two separate liquid layers and a solid layer 8A – Non homogeneous intractable mass 9A – Two separate liquid layers

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ANNEXURE C: FORMULATIONS FOR PATENT DECLARATION B

Percentages by weight of components and status of formulae

COMPONENTS	CONTROL B	1B	2B	3B	4B	5B	6B	7B	8B	9B
ETHYL OLEATE	20.0	20.0	20.0	20.0	80.0	60.0	9.41	14.12	8.42	16.84
AMMONIUM SULFATE dry	15.0	15.0	15.0	15.0	3.75	7.5	60.0	40.0	6.32	12.63
Dimethyl laurylamine oxide dry basis; variant surfactant	5.0	-	-	-	1.25	2.5	2.35	3.53	60.0	20.0
Sorbitan mono oleate, 20 moles EO; Tween 80; variant surfactant, dry	-	5.0	-	-	-	-	-	-	-	-
Sodium lauryl ether(2) sulfate; variant surfactant, dry basis	-	-	5.0	-	-	-	-	-	-	-
Water, including water associated with variant surfactant	35.0	35.0	35.0	40.0	8.75	17.50	16.47	24.71	14.74	29.47
1,3 Butanediol	8.0	8.0	8.0	8.0	2.0	4.0	3.76	5.65	3.37	6.74
$C_{8/10}$ Alkyl glucoside 70%	8.0	8.0	8.0	8.0	2.0	4.0	3.76	5.65	3.37	6.74
Citric acid	1.0	1.0	1.0	1.0	0.25	0.5	0.47	0.71	0.42	0.84
Oleic acid diethanolamide	8.0	8.0	8.0	8.0	2.0	4.0	3.76	5.63	3.37	6.74
STATUS	GOOD	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	GOOD

CONTROL B – Clear & bright liquid micro-emulsion, stable at 2°C, 20°C and 54°C.
1B – Two separate liquid layers 2B – Two separate liquid layers 3B – Two separate liquid layers 4B – Two separate liquid layers 5B – Two separate liquid layers 6B – A liquid layer and a solid layer
7B - Two separate liquid layers and a solid layer 8B – Non homogeneous intractable mass 9B – Clear & bright liquid micro-emulsion, stable at 2°C, 20°C and 54°C.

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Website: www.vicchem.com *E-mail: products@vicchem.com*

ANNEXURE D: FORMULATIONS FOR PATENT DECLARATION

C & D

Percentages by weight of components and status of formulae

COMPONENTS	CONTROL C	1C		CONTROL D	1D	
PROPAR 12 MINERAL OIL	15.0	15.0		0.0	0.0	
ETHYL OLEATE	0.0	0.0		15.0	15.0	
AMMONIUM SULFATE dry	5.0	5.0		5.0	5.0	
Dimethyl laurylamine oxide dry basis; variant surfactant	1.5	0.5		1.5	0.5	
Water, including water associated with variant surfactant	58.5	59.5		50.0	51.0	
1,3 Butanediol	3.0	3.0		8.0	8.0	
$C_{8/10}$ Alkyl glucoside 70%	7.0	7.0		10.0	10.0	
Sorbitan monooleate	5.0	5.0		0.0	0.0	
Citric acid	0.0	0.0		0.5	0.5	
Lauric acid diethanolamide	5.0	5.0		10.0	10.0	
STATUS	GOOD	FAIL		GOOD	FAIL	

CONTROL C – Clear & bright liquid micro-emulsion, stable at 2°C, 20°C and 54°C.
1C – Hazy micro-emulsion at 20°C, unstable at 2C and 54C forms two layers

CONTROL D – Clear & bright viscous liquid micro-emulsion, stable at 2°C, 20°C and 54°C.
1D – Hazy gel at 20°C, unstable at 2°C and 54°C forms two layers